Attorney Docket No. 2003P01975WOUS

CERTIFICATION OF ATTACHED ENGLISH TRANSLATION OF PCT APPLICATION:

PCT/EP2004/053689 based on DE 103 60 898.2 filed 12/23/2003

I hereby certify the English translation attached is a true and accurate copy of the referenced PCT/EP2004/053689 application.

Craig J. Loest
June 22, 2006
Registration No. 48,557

CLOTHES DRYER

[001] This invention relates to a dryer with a rotary drum for receiving laundry and a bearing for rotary mounting of the drum.

[002] Dryers are known in which a drum is arranged horizontally for receiving laundry, and is pivoted by pivot bearings. The pivot bearings are subject to high thermal loads which negatively influence the reliability and life of the bearings, particularly when they are arranged adjacent to ducts conveying hot process air.

[003] The object of the invention is to make available a dryer that operates reliably, with a drum that is swivelled by means of a bearing.

[004] This object is achieved by the characteristics in Claim 1. Advantageous embodiments and further developments of the invention are described in the dependent claims.

[005] A dryer has a housing in which a drum for receiving laundry is swivelled by means of a bearing. To ensure that the bearing operates reliably at all times, a cooling device is provided for cooling the bearing. This enables the maximum thermal expansion of the drum bearing components to be reduced and hence also the mechanical load. Furthermore, the lubricant provided for the bearing is subjected to lower loads because of the cooling of the bearing if the bearing is operated at lower temperatures. Moreover, there is reduced risk of the lubricant in the bearing becoming fluid at low temperatures and escaping. This increases the life and reliability of the bearing, and hence of the dryer.

[006] In an advantageous embodiment the cooling device comprises means for improving the radiation and/or convection of heat from the bearing or adjacent to the bearing. In particular, cooling faces may be provided which are connected thermally and conductively to the bearing. Such cooling faces may be formed by a suitably large surface design of the bearing bracket or by providing cooling ribs.

[007] In an advantageous embodiment the cooling device has a device for conveying cooling air, preferably ambient air, to the bearing. This makes available active cooling with which defined thermal conditions can be created on the bearing.

[008] In an advantageous embodiment a fan is provided for conveying process air through the drum and/or for conveying cooling air for a condenser, wherein the fan serves as a device for conveying cooling air to the bearing. This also makes it possible to make use of fans that are already installed in the dryer, either a fan for conveying process air or a fan for conveying cooling air to a condenser, as a cooling device for cooling the bearing.

[009] In an advantageous embodiment a process air conduit is provided, wherein a section of the process air conduit and/or the drum is loaded with a vacuum due to the conveying action of the fan, and forms a vacuum space. Furthermore, a cooling conduit is provided between the vacuum space and the bearing so that air is sucked in adjacent to the bearing in the form of ambient air and conveyed by the cooling conduit as spent air to the process air.

[010] In an advantageous embodiment the bearing has a bearing bracket which is secured to the housing, and a process air duct has an air distribution hood adjacent to the bearing which covers the process air inlet holes into the drum, wherein a cooling air conduit is formed between the air distribution hood and the bearing bracket, in the form of an annular gap, so that a cooling air flow is able to flow through the annular gap into the process air duct in the form of ambient air. The bearing is flushed on all sides with cooling air through the annular gap and is therefore effectively cooled.

[011] In an advantageous embodiment a process air conduit is provided, wherein a section of the process air conduit and/or the drum is loaded with excess pressure by the conveying action of the fan, and forms an excess pressure space. Furthermore, a cooling conduit is provided between the excess pressure space and the bearing, so that some of the conveyed air is fed to the bearing in order to cool the bearing.

[012] In an advantageous embodiment the process air conduit is provided as a circuit with a condenser which is cooled by a cooling air flow. Some of the cooling air flow is branched and fed via a cooling air conduit to the bearing in order to cool the bearing.

[013] In an advantageous embodiment the cooling conduit is dimensioned so that the quantity of cooling air can be predetermined.

[014] Further details, characteristics and advantages of the invention are evident from the following description of a preferred exemplary embodiment of a dryer according to the invention, with reference to the drawings,
[015] in which:

[016] Figure 1 shows a sectional view of a dryer with a bearing for the drum according to a first exemplary embodiment;

[017] Figure 2 shows a detailed view of the bearing according to the dryer in Figure 1;

[018] Figure 3 shows a sectional view of a dryer with a bearing for the drum according to a second exemplary embodiment;

[019] Figure 4 shows a detailed view of the bearing according to the dryer in Figure 3;

[020] Figure 5 shows a sectional view of a dryer with a bearing for the drum

[021] as a modified first or second exemplary embodiment.

[022] According to Figures 1 and 2 a first exemplary embodiment of a dryer is represented in the form of an exhaust dryer. The dryer has a housing 1, a drum 2 mounted in housing 1, a front end plate 3, a feed door 4 arranged in the front end plate 3 and a lint screen 5 fitted in the lower section of front end plate 3. Drum 2 is mounted in the front section above rollers 6 arranged on the front end plate 3 and in the rear section above a central bearing 9 arranged on rear wall 8 of drum 2, which bearing is in turn secured by a bracket 10 to rear wall 11 of housing 1. Drum 2 is rotated about horizontal axis 14 by a motor 1 and a belt 13. The dryer has a process air conduit 15 which, in this exemplary embodiment, comprises an inlet opening 16, an inlet duct 17, an air distribution hood 18 connected to it, which covers process air inlet holes 19 arranged on rear wall 8 of drum 2, a process air outlet grid 20, lint screen 5 and an

outlet duct 21, with a fan 22. A heater 23 is also arranged in inlet duct 17. The process air flows in arrow direction 24 from the ambient atmosphere into inlet opening 16 via inlet duct 17, heater 23, air distribution hood 18, drum 2, process air outlet grid 20, lint screen 5, outlet duct 21 and fan 22 back into the ambient atmosphere. Air distribution hood 18 is sealed against rear wall 8 of drum 2 by means of a rear seal 25. Upstream from fan 22, a vacuum space is formed, in particular in drum 2 and air distribution hood 18.

[023] Bearing 9 is shown in more detail ion Figure 2. Bearing 9 has a shaft 26 which is secured to rear wall 8 of drum 2, and a spherical bearing member 27, which is preferably manufactured from oil saturated sinter material. Bearing member 27 has a hole 28 in which shaft 26 is able to rotate. Furthermore, bearing 9 has two seals 29. Bracket 10 has an outer half-shell 30 and an inner half-shell 31, between which the spherical bearing member 27 is retained. Between outer half-shell 30 and inner half-shell 31 is arranged a conical spring element 32, which restricts the bearing member 27 from also rotating. Spherical bearing member 27 is able to perform swivel movements transversely to horizontal shaft 14, to compensate for an angular displacement of drum 2. The central section of air distribution hood 18 is secured on the inside of bracket 10, parallel with bracket 10, forming an annular gap 33. Annular gap 33 is formed by spacer members 34, which are formed on air distribution hood 18.

[024] Outer half-shell 30 and inner half-shell 31 are each manufactured from a steel sheet which is capable of transferring heat away from the bearing and discharging heat by thermal radiation and convection. However, since there is hot process air between rear wall 8 of the drum and air distribution hood 18, bearing 9 is subjected to considerable heating. Due to the provision of annular gap 33 between bracket 10 and air distribution hood 18, a cooling conduit is formed between the vacuum space in the drum 2 and bearing 9, wherein cool ambient air is sucked into the process air as so-called spent air passing through annular gap 33 on bearing 9. In particular, fan 22, which is responsible for building up the vacuum in drum 2, therefore serves as a conveying device. Because of the formation of the relatively long, parallel annular gap 33, a large surface is made available for heat transfer from the hot bearing to the cooling ambient air flowing through annular gap 33. A very simple device is therefore made available for cooling bearing 9 using the other devices, such as fan 22 of the dryer.

[025] Figures 3 and 4 show a second exemplary embodiment of the dryer in the form of a condensation dryer. Only the differences relative to the dryer designed as an exhaust dryer are shown below in Figures 1 and 2. Process air conduit 15 is designed as a closed circuit in which a condenser 35 is also inserted, which condenser is normally designed as a cross flow or counterflow condenser, and is cooled by means of a condenser cooling air flow 36. Condenser cooling air flow 36 is produced in a condenser cooling air conduit 38 by an additional fan 37, which can be mounted on the same drive shaft as fan 22. A cooling air conduit 41, which opens into a space 39 between rear wall 11 of housing 1 and bracket 10, is branched off from the section of condenser cooling air conduit 38 on the pressure side. As shown in more detail in Figure 4, the cooling air flows into space 39, and through openings 40 formed in the bracket into annular gap 33 between bracket 10 and air distribution hood 18.

[026] Figure 5 shows a modification both for the exemplary embodiment according to Figure 1 and 2 and for the exemplary embodiment in Figures 3 and 4. In this modification the direction of the cooling air flow according to Figure 4 is reversed, and cooling air is sucked off through cooling air conduit 41 from space 39 through annular gap 33. Here the suction may take place on cooling air conduit 41 either via the suction side of condenser cooling air conduit 38 (Figure 3) or via the suction side of process air conduit 15, upstream from heater 23 shown ion Figure 1.

[027] Alternatively to the embodiment shown in Figure 1, fan 22 may be arranged upstream from drum 2, so that an excess pressure prevails in the process air conduit before drum 2, and also in drum 2. Some of this air upstream from drum 2, and also upstream from heater 23, may be fed through a branch conduit to bearing 9 in order to cool bearing 9.